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ance Notes on Codes and Abbreviations" appearing at the begin-
ning of each regular issue of the PCT Gazette.*

(54) Title: **METHOD OF PRODUCING STRETCHABLE FABRICS**

(57) Abstract: A method of treating a woven fabric to produce a stretchable fabric combination which comprises applying heat and pressure to the fabric in such a manner that the yarn strands substantially across the width of the fabric are forced closer together thus imparting generally semi-permanent stretch into the fabric while simultaneously at least partially bonding thereto a synthetic interlining fabric employing a stretchable bonding agent or film. The woven fabric employed in the method of the invention will usually be of a non-synthetic textile material, for example wool or cotton, which can not normally be permanently set by heat alone. By contrast, the interlining material will normally be a synthetic material which is thermoplastic and can be heat set, such as a polyester or polyamide textile material. The bonding coating or film is preferably material which as well as bonding will impart stretch to the final combined product and it is preferred for this purpose to use a polyurethane material. The material may be coated on either the woven non-synthetic fabric or the interlining fabric or may be a film interposed between the two.

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METHOD OF PRODUCING STRETCHABLE FABRICS

This invention relates to a process for treating fabric and to the fabric produced, particularly but not exclusively for application in clothing manufacture, which enables a certain degree and type of stretch to be imparted to, for example, a waistband.

Conventionally, waistband interlining can be elasticated and the outer fabric of the waistband "rouched" or "gathered" providing for a degree of stretch but at the expense of compromising the "tailored" look and fit of the garment to which such an elasticated waistband is attached. Alternatively, it comprises a "non-stretch" interlining which acts as a stiffener stabilising the outer fabric, affording some degree of reinforcement and perhaps providing added resilience. The disadvantage of the latter system of construction is that there is little "give" or "ease" in that area of the garment incorporating the waistband, and the fit of the garment may become uncomfortable to the wearer for example after meals when the waist expands. In prolonged wear, the top of the waistband can be forced to "give way" and effectively "roll over", rendering the look of the garment unsightly. In addition, a wearer falling mid-way between sizing of "off the peg" waistbanded garments selects a garment which is either too tight or too loose in wear.

In our European patent publication EP-B-0705356 we disclose a method of treating a woven fabric characterised in the combination of two stages - a first stage which includes applying heat and pressure to the fabric in such a manner that the yarn strands substantially across the width of the fabric are forced closer together thus imparting generally semi-permanent "ease" or "stretch" into the fabric, and a subsequent, second stage which includes affixing to the fabric treated according to the first stage of the method a selected interlining and/or interlining combination having inherent stretch whereby the semi-permanent "ease" or "stretch" imparted to the fabric during the first stage is made substantially permanent during the second stage.

The interlining or interlining combination used in the method of the above European patent publication must itself have sufficient stretch characteristics, and sufficiently powerful

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elasticity, in order to ensure that the woven fabric in the finished combination is brought back to its original length after stretching.

Such interlinings or interlining combinations are available but are relatively expensive to produce and may involve relatively expensive stretch yarns such as "Lycra" yarns.

The present invention seeks to provide a method of producing a combined fabric with similar stretch characteristics to that described in our above-mentioned European patent publication, initially employing less resilient and less expensive interlinings or interlining combinations, and additionally to provide a method capable of producing such fabrics in a single step process.

According to the present invention there is provided a method of treating a woven fabric to produce a stretchable fabric combination which comprises applying heat and pressure to the fabric in such a manner that the yarn strands substantially across the width of the fabric are forced closer together thus imparting generally semi-permanent stretch into the fabric while simultaneously at least partially bonding thereto a synthetic interlining fabric.

Preferably, the bonding is carried out employing a stretchable bonding agent or film.

While not restricted thereto, the woven fabric employed in the method of the invention will usually be of a non-synthetic textile material, for example wool or cotton, which can not normally be permanently set by heat alone. By contrast, the interlining material will normally be a synthetic material which is thermoplastic and can be heat set, such as a polyester or polyamide textile material.

The bonding coating or film is preferably material which as well as bonding will impart stretch to the final combined product and it is preferred for this purpose to use a polyurethane material. The material may be coated on either the woven non-synthetic fabric or the interlining fabric or may be a film interposed between the two. This is employed where additional 'pull' is required to give the necessary stretch and recovery

to the final product. Where, for example, it is desired to attach a (non-stretch) interlining to a stretch fabric, then this may not be necessary, as discussed more fully hereinafter.

The method of the invention is preferably carried out by the machine as described in our above-mentioned European patent publication which comprises means for applying heat and pressure to a woven fabric, and transport means for effecting relative movement between the heat and pressure application means and the fabric whereby passage of the fabric through the apparatus results in the yarn strands substantially across the width of the fabric being forced closer together thus imparting semi-permanent stretch into the fabric. This process may be described as "compressive shrinking" for the purposes of simplicity in the present description. When applied to a non-synthetic woven fabric, compressive shrinking produces stretch but this is not permanent in the sense that it is gradually lost or, if a subsequent heat or steam treatment is applied, will be lost completely at once. Thus, in the process of our above-mentioned European patent publication, the second stage was used to fix, or render "permanent", the stretch characteristics.

In the process of the present invention the interlining material is both fixed to the woven non-synthetic fabric and at the same time is itself set so that the compressive shrinking applied to it is "permanent". Being bonded to the woven fabric it renders the stretch imparted to that fabric "permanent" also.

The interlining material used may be a fine woven polyamide or polyester fabric, preferably the latter, although other fabric structures could be used, such as needled or water entangled non-wovens. While the interlining supplied for use with our above-mentioned European patent publication needed to have a considerable degree of stretch and high elastic modulus, that used initially in the present invention may be of less stretchable and much cheaper material. The additional stretchability is supplied by the compressive shrinking and the extra elastic modulus may be supplied by the bonding material which is why polyurethane is preferred.

One passage through the machine may be sufficient to produce the finished product in that the bond produced by the bonding coating or film is sufficiently strong for the combination

to withstand subsequent wear. Alternatively, if this is not the case, the combined fabric can be passed through a subsequent means such as that described in our above mentioned patent publication for affixing the fabric previously treated in the compressive shrinking area by a second application of heat and pressure to effect complete bonding.

As before, the fabric may be treated in full width form but typically it is treated in strips which are then formed into trouser or skirt waistbands. Clearly the cost of a machine to treat such strips of material is considerably less than that required to treat fabric in full width. It is therefore an advantage of the invention that, with the interlining necessary to stabilise the stretch in the woven fabric being effectively produced at the same time as it is affixed to the woven fabric, the interlining is produced in narrow width, and a full-width production machine for the interlining is rendered unnecessary.

There are, however, many applications where this process could be used in a wide width form, e.g. from 1.5 metres to 5 metres width, where there is a requirement to convert rigid fabrics into ones with linear stretch.

It has been found that, at the temperature normally used in the compressive shrinking process the interlining fabric, a thermoplastic synthetic material, typically a polyester fabric, is heat set so that the extra elasticity imparted to it by the compressive shrinking process is rendered "permanent".

Where stretch fabrics are utilised in the production of stretch trouser or skirt waistbands, the majority of manufacturers prefer to affix, e.g. fuse, a stretch interlining to the surface of the waistband. This stretch interlining is generally, although not always, of a non-woven material and is significantly more expensive than its 'rigid' equivalent. The interlining in this case is not required to impart elastic recovery properties to the waistband as the waistband fabric is already a stretch variety. The stretch interlining is used to make the waistband fabric more substantial and easier to handle in subsequent processing.

In accordance with a further embodiment of the invention a standard rigid fusible non-woven or other relatively rigid knitted material may be processed in narrow width form

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with the stretch waistband fabric through the above-mentioned compressive shrinking machine to convert the two into a laminate which has stretch characteristics in the length direction. As the waistband fabric is a stretch material, the interlining needs only to move with the fabric and is not required to provide additional stretch recovery, and thus a stretchable bonding agent is not required (although a bonding agent may be used).

In addition, the stretch fabric may be tensioned during processing with the 'rigid' interlining so that it is compressively 'shrunk' back to its original dimensions. That is, if the process achieves 20% shrinkage in the interlining, the waistband fabric would be pre-tensioned out by 25% of its length prior to compressive shrinking. After processing it would then shrink back to its original length.

While the fabric of the invention is primarily useful for waistbands for skirts, trousers and the like it is not so-limited. Other uses will become apparent to those skilled in the art. For example, as disclosed in our PCT application GB99/01146, parts of the woven fabric can be left unstabilised, or stabilised to a lesser degree, so that on subsequent relaxation the composite assumes a desired shape, for example a curved shape, which may be useful in many areas in garment construction.

The invention further extends to the combined fabric produced in accordance with the method of the invention.

CLAIMS

1. A method of treating a woven fabric to produce a stretchable fabric combination which comprises applying heat and pressure to the fabric in such a manner that the yarn strands substantially across the width of the fabric are forced closer together thus imparting generally semi-permanent stretch into the fabric while simultaneously at least partially bonding thereto a synthetic interlining fabric..
2. A method as claimed in claim 1 wherein the woven fabric is a non-synthetic textile material, for example wool or cotton, which cannot normally be permanently set by heat alone.
3. A method as claimed in either of claims 1 or 2 in which the interlining material is a synthetic material which is thermoplastic and can be heat set, such as a polyester or polyamide textile material.
4. A method as claimed in any of claims 1 to 3 in which the bonding is carried out by coating or film which as well as bonding will impart stretch to the final combined product.
5. A method as claimed in claim 4 in which the bonding coating or film is a polyurethane material.
6. A method as claimed in any of claims 1 to 5 in which the bonding coating or film is coated on either the woven non-synthetic fabric or the interlining fabric or is a film interposed between the two.
7. A method as claimed in any of claims 1 to 6 wherein the interlining material used is a fine woven polyamide or polyester fabric.

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8. A method as claimed in claim 1 wherein a standard rigid fusible non-woven or other relatively rigid knitted material is processed in narrow width form with a stretch waistband fabric to produce a laminate which has stretch characteristics in the length direction.
9. A method as claimed in claim 9, wherein the stretch fabric is tensioned during processing with the interlining so that it is compressively 'shrunk' back to its original dimensions.
10. A fabric produced in accordance with the method of the preceding claims.

INTERNATIONAL SEARCH REPORT

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A. CLASSIFICATION OF SUBJECT MATTER

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According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 D06C A41H

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, PAJ, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	GB 2 256 785 A (MARKS AND SPENCER PLC) 23 December 1992 (1992-12-23) page 10, line 3 - page 11, line 28	1, 6, 10
A	EP 0 705 356 B (D.E. MORRIS) 14 October 1998 (1998-10-14) cited in the application column 1, line 38 - line 47 column 2, line 3 - line 17 column 5, line 18 - line 48	1, 2, 10

☐ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

* Special categories of cited documents :

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E earlier document but published on or after the international filing date

L document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

O document referring to an oral disclosure, use, exhibition or other means

P document published prior to the international filing date but later than the priority date claimed

T later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

X document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

Y document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
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